SCIENTIFIC NOTES

***Martarega hondurensis* and *Buenoa antigone* as predators of mosquito larvae in Costa Rica (Hemiptera: Notonectidae).**—*Buenoa antigone* Kirkaldy inhabits freshwater pools in southern United States, Mexico, Central and South America (Truxal, 1953 Univ. Kansas Sci. Bull. 35: 1351–1523). *Martarega hondurensis* Bare has been recorded from Mexico, Central America and Peru (Truxal, 1949, J. Kansas Entomol. Soc. 22: 1–24) and is found aggregated into schools in deep sheltered eddies of rivers, as is *M. mexicana* Truxal (Menke and Truxal, 1966 Los Angeles Co. Mus. Contr. Sci. 106: 1–6). Under certain circumstances both species prey on mosquito larvae, and one shows potential as a biological control agent.

In July, 1972, I surveyed the fauna of two dozen small water-filled depressions ($2m^2$ or less) in rock outcroppings along the banks of the Corobici and Tenorio Rivers, 5 km from Canas, Guanacaste, Costa Rica. Other than notonectids, these pools seemed to lack potential mosquito predators. Six pools which contained *Buenoa* (predominately *B. antigone*) lacked mosquito larvae, while the others containing no *Buenoa* had large aggregations of mosquito larvae.

At each pool I recorded a number of habitat parameters (size of the pool, depth and character of the bottom sediments, water turbidity, temperature, pH, vegetation, amount of shade, water depth and presence of other aquatic organisms). The distribution of backswimmers and mosquito larvae was similar with respect to these parameters, the only difference between habitats being the presence of the backswimmers and mosquito larvae themselves. Whether the distribution of *Buenoa* in pools is a fortuitous event or is dependent upon some undetermined factor remains unclear, but it seems probable that the absence of mosquito larvae in these pools is related to the presence of *Buenoa.*

In Santa Rosa National Park, Guanacaste, Costa Rica, *Buenoa* were especially abundant and were never found together with mosquito larvae in several large ponds that were surveyed. Other potential mosquito predators in these ponds may have reduced numbers of larvae, but the high density of *Buenoa* suggests that the backswimmers may have had a significant part in mosquito elimination.

Laboratory experiments tended to confirm the predator-prey relationship suggested by field observations. *B. antigone* were collected and kept in jars (110 ml) for 24 hours at air temperature. Each jar contained two *B. antigone* as well as five mosquito late instars. In twelve repetitions (six late instars, six adults) all mosquito larvae offered were eaten. *Martarega hondurensis* from river sites adjacent to the rock outcroppings where *B. antigone* occurred were offered mosquito larvae in the same format as used for *Buenoa.* After 24 hours adult *Martarega* had consumed an average of 2.6 of 5 larvae offered in each of 33 repetitions, while late instars ate an average of 1.4 of 5 in each of 39 repetitions. Clearly, under these conditions, *M. hondurensis* ate mosquitoes at a slower rate than did *B. antigone.*

Martarega seemed more inclined to cannibalism than to mosquito predation. In 3.5 liter glass aquaria containing from 15 to 20 *M. hondurensis*, 15 to 20 mosquito larvae were offered but not eaten, but earlier instar *M. hondurensis* were often cannibalized. Under similar conditions *B. antigone* rapidly ate mosquito larvae, with no cannibalism.

Prey preference tests showed that *B. antigone* ate mosquito larvae and water boatmen before ostracods, blood worms, mosquito pupae and ants ($P \leqslant .05$)

(Gittelman, in preparation). Probably *Buenoa* are capable of subsisting on a variety of prey, allowing them to be effective predators on mosquito larvae while not totally depending on them for their distribution. When offered a similar selection of prey types, *M. hondurensis* ate ants struggling at the water surface before all other prey species including mosquito larvae ($P \leqslant .01$).

B. antigone is readily maintained in the laboratory but breeding under laboratory conditions has not been attempted. It is likely that these insects lay their eggs on or in plant material. In either case, eggs could be collected by harvesting plants or some artificial oviposition substrate (Toth and Chew, 1972b). Since *B. antigone* does not cannibalize even in crowded laboratory enclosures, little difficulty would be expected in mass rearing. In contrast, *M. hondurensis* would necessitate separate containers, for each individual.

The suggestion that backswimmers be used for mosquito control (Toth and Chew, 1972, Ann. Entomol. Soc. Amer. 65: 1270–79; 1972. Env. Entomol. 1: 534–5; Ellis and Borden, 1970, Ann. Entomol. Soc. Amer. 63: 963–73) seems well applied to *B. antigone* but not to *M. hondurensis*. Although both species will eat mosquito larvae, *M. hondurensis* do so at a slower rate than do *B. antigone*. In addition it would appear impractical to distribute *M. hondurensis* as a biological control agent because it tends to inhabit moving water where mosquito larvae are not prevalent. On the other hand, *B. antigone* seem to prefer mosquito larvae as food, and their microhabitats generally overlap.—STEVEN H. GITTELMAN, *Division of Biological Sciences, U-42, University of Connecticut, Storrs 06268.*

Biological observations on darkling ground beetles from western North America (Coleoptera: Tentyriidae).—*Coelosattus fortineri* Blaisdell (1927) was originally described from the Algodones Sand Dunes of California; this genus was placed in synonymy under *Eusattus* (Doyen, 1972: Quaest. Ent., 8: 357–376). *Coelomorpha maritima* Casey (1890) was originally described from "lower California." This genus was later placed in synonymy under *Coelus* (Doyen, 1972). Subsequent to their original descriptions, these beetles have remained largely unknown in collections, although both are locally abundant.

Seventy-six individuals of *Eusattus fortineri* were collected from the Algodones Dunes, 2 mi. N. Glamis, Imperial County, California, during April, 1972. Four of these were encountered on the sand surface between 1900–2300 hrs. (PST). The remainder were excavated from the sand around the bases of creosote bush (*Larrea divaricata* Cavanilles), at depths of 6–20 cm. The distribution of the beetles was highly aggregated, with 28 individuals buried beneath a single plant. A typical assemblage consisted of six to eight beetles, and only three groups of less than three individuals were discovered. Beetles were found only beneath plants with canopies close to the sand. Suitability of plants as shelters depends on the degree of shading of the sand about their bases, since exposed substrates in the Algodones Dunes reach midday temperatures well above 40°C during warm months.

E. fortineri appears to be abundant within its restricted geographic range, which coincides with the distribution of exceptionally fine sand composing the Algodones Dunes and adjacent dunes in southwestern Arizona and northwestern Mexico. Its allopatric counterpart in other areas of western North America is the morphologically similar *E. muricatus* LeConte, which occurs on a variety of